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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/653,317	09/02/2003	Lonnie Scott Jaynes	51316 (GCSD1411 H7348)	2800

7590 02/24/2005

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EXAMINER	
KIM, DAVID S	

ART UNIT	PAPER NUMBER
2633	

DATE MAILED: 02/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/653,317	JAYNES ET AL.	
	Examiner	Art Unit	
	David S. Kim	2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *02 September 2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Bhatt et al.

2. **Claims 1-4, 10-16, 21-24, and 26-27** are rejected under 35 U.S.C. 102(b) as being anticipated by Bhatt et al. (U.S. Patent No. 5,517,213, hereinafter "Bhatt").

Regarding claim 1, Bhatt discloses:

A method for processing an optical communication signal (signal in fiber optic in col. 2, l. 64) that has been transported over a dispersive optical communication channel (fiber optic in col. 2, l. 64), so as to recover an unknown information signal contained said optical communication signal, comprising the steps of:

(a) converting said optical communication signal into an electrical communication signal (RF modulated signal in col. 2, l. 63-64); and

(b) filtering said electrical communication signal by means of an adaptive infinite impulse response (IIR) filter (IIR digital filter in col. 3, l. 3-4) to produce a channel distortion-compensated output signal.

Regarding claim 2, Bhatt discloses:

The method according to claim 1, wherein filtering said electrical communication signal includes updating weighting coefficients (coefficient control network 80 in Fig. 1) of said

adaptive filter by processing said channel distortion-compensated output signal and at least one of:

- the output of a decision operator (slicer 40 in Fig. 1) to which said channel distortion-compensated output signal is coupled, said decision operator being operative to produce an output data stream in accordance with prescribed decision criteria applied to said channel distortion-compensated output signal,

- an undistorted version of a known signal pattern contained in said optical communication signal,

- prescribed statistics or other quantities of one or more system signals (blind equalization process in Fig. 2, col. 4, l. 54 – col. 5, l. 17).

Regarding claim 3, Bhatt discloses:

The method according to claim 2, wherein step (b) comprises updating weighting coefficients of said adaptive filter by processing said channel distortion-compensated output signal (output from demodulator 30 in Fig. 1) and the output of said decision operator (output from slicer 40).

Regarding claim 4, Bhatt discloses:

The method according to claim 3, wherein step comprises generating weighting coefficients of said adaptive filter by differentially (col. 3, l. 26-35) combining said channel distortion-compensated output signal and the output of said decision operator produce an error signal and coupling said error signal to coefficient generator for said adaptive IIR filter.

Regarding claim 10, Bhatt discloses:

The method according to claim 1, wherein step (b) includes updating weighting coefficients of said adaptive IIR filter by processing said channel distortion-compensated output signal and multiple ones of

- the output of a decision operator (slicer 40 in Fig. 1) to which said channel distortion-compensated output signal is coupled, said decision operator being operative to produce an output data stream in accordance with prescribed decision criteria applied to said channel distortion-compensated output signal,

- an undistorted version of a known signal pattern contained in said optical communication signal, and

- prescribed statistics or other quantities of one or more system signals (blind equalization process in Fig. 2, col. 4, l. 54 – col. 5, l. 17).

Regarding claim 11, Bhatt discloses:

The method according to Claim 2, wherein step (b) comprises updating weighting coefficients of said adaptive IIR filter in accordance with said prescribed statistics or other quantities of one or more system signals (blind equalization process in Fig. 2, col. 4, l. 54 – col. 5, l. 17).

Regarding claim 12, Bhatt discloses:

The method according to Claim 11, wherein step (b) comprises updating weighting coefficients of said adaptive IIR filter in accordance with prescribed statistics or other quantities of said electrical communication signal (blind equalization process in Fig. 2, col. 4, l. 54 – col. 5, l. 17).

Regarding claim 13, Bhatt discloses:

A receiver apparatus for processing an optical communication signal (signal in fiber optic in col. 2, l. 64) that has been transported over a dispersive optical communication channel (fiber optic in col. 2, l. 64), and recovering therefrom an unknown information signal contained in said optical communication signal, said receiver apparatus comprising:

an opto-electronic converter (inherent to convert signal in fiber optic in col. 2, l. 64 into electrical RF signal in col. 2, l. 63-64) that is operative to convert said optical communication signal into an electrical communication signal (RF modulated signal in col. 2, l. 63-64);

an adaptive infinite impulse response (IIR) filter (IIR digital filter in col. 3, l. 3-4) coupled to filter said electrical communication signal and producing a channel distortion-compensated output signal; and

a coefficient update mechanism (coefficient control network 80 in Fig. 1), which is operative to update weighting coefficients of said adaptive IIR filter.

Regarding claim 14, Bhatt discloses:

The receiver apparatus according to claim 13, wherein said coefficient update mechanism is operative to update weighting coefficients of said adaptive IIR filter in accordance with at least one of:

- the output of decision operator (slicer 40 in Fig. 1) to which said channel distortion-compensated output signal is coupled, said decision operator being operative to produce an output data stream in accordance with prescribed decision criteria applied to said channel distortion-compensated output signal,

- an undistorted version of a known signal pattern contained in said optical communication signal, and

- prescribed statistics other quantities of one or more system signals (blind equalization process in Fig. 2, col. 4, l. 54 – col. 5, l. 17).

Regarding claim 15, Bhatt discloses:

The receiver apparatus according to claim 14, wherein said coefficient update mechanism is operative to update weighting coefficients of said adaptive IIR filter by processing said channel distortion-compensated output signal (output from demodulator 30 in Fig. 1) and the output of said decision operator (output from slicer 40).

Regarding claim 16, Bhatt discloses:

The receiver apparatus according to claim 15, wherein coefficient update mechanism is operative to generate weighting coefficients of said adaptive IIR filter by differentially (col. 3, l. 26-35) combining said channel distortion-compensated output signal and the output of said decision operator to produce an error signal and coupling said error signal to coefficient generator for said adaptive IIR filter.

Regarding claim 21, Bhatt discloses:

The receiver apparatus according to Claim 14, wherein said coefficient update mechanism is operative to update weighting coefficients of said adaptive IIR filter in accordance with said prescribed statistics or other quantities of one or more system signals (blind equalization process in Fig. 2, col. 4, l. 54 – col. 5, l. 17).

Regarding claim 22, Bhatt discloses:

The receiver apparatus according to Claim 21, wherein said coefficient update mechanism is operative to update weighting coefficients of said adaptive IIR filter in accordance with prescribed statistics or other quantities of said electrical communication signal (blind equalization process in Fig. 2, col. 4, l. 54 – col. 5, l. 17).

Regarding claim 23, Bhatt discloses:

A receiver apparatus for processing an optical communication signal (signal in fiber optic in col. 2, l. 64) that has been transported over a dispersive optical communication channel (fiber optic in col. 2, l. 64), and recovering therefrom an unknown information signal contained in said optical communication signal, said receiver apparatus comprising:

an opto-electronic converter (inherent to convert signal in fiber optic in col. 2, l. 64 into electrical RF signal in col. 2, l. 63-64) that is operative to convert said optical communication signal into an electrical communication signal (RF modulated signal in col. 2, l. 63-64);

an adaptive filter (adaptive equalizer 20 in Fig. 1) coupled to filter said electrical communication signal and producing a channel distortion-compensated output signal; and

a filter coefficient update mechanism (coefficient control network 80 in Fig. 1), exclusive of said adaptive filter, and being operative to adaptively update weighting coefficients of said adaptive filter.

Regarding claim 24, Bhatt discloses:

The receiver apparatus according to claim 23, wherein said filter update mechanism is operative to update weighting coefficients of said adaptive filter in accordance with at least one of:

- the output of a decision operator (slicer 40 in Fig. 1) to which said channel distortion-compensated output signal is coupled, said decision operator being operative to produce an output data stream in accordance with prescribed decision criteria applied to said channel distortion-compensated output signal,

- an undistorted version of a known signal pattern contained in said optical communication signal and exclusive of a training signal, and

- prescribed statistics or other quantities one more system signals (blind equalization process in Fig. 2, col. 4, l. 54 – col. 5, l. 17).

Regarding claim 26, Bhatt discloses:

The receiver apparatus according to Claim 24, wherein said filter update mechanism is operative to update weighting coefficients of said adaptive filter in accordance with said prescribed statistics or other quantities of one or more system signals (blind equalization process in Fig. 2, col. 4, l. 54 – col. 5, l. 17).

Regarding claim 27, Bhatt discloses:

The receiver apparatus according to Claim 26, wherein said filter update mechanism is operative to update weighting coefficients of said adaptive in accordance with prescribed

statistics or other quantities of said electrical communication signal (blind equalization process in Fig. 2, col. 4, l. 54 – col. 5, l. 17).

Choa

3. **Claims 23-24** are rejected under 35 U.S.C. 102(b) as being anticipated by Choa (U.S. Patent Application Publication No. US 2001/0036334 A1).

Regarding claim 23, Choa discloses:

A receiver apparatus for processing an optical communication signal (signal in fiber 110 in Fig. 4) that has been transported over a dispersive optical communication channel (fiber 110 in Fig. 4), and recovering therefrom an unknown information signal contained in said optical communication signal, said receiver apparatus comprising:

an opto-electronic converter (detector 120 in Fig. 6) that is operative to convert said optical communication signal into an electrical communication signal;

an adaptive filter (adaptive equalizer 150 in Fig. 4) coupled to filter said electrical communication signal and producing a channel distortion-compensated output signal; and

a filter coefficient update mechanism (weight updater 240 in Fig. 4), exclusive of said adaptive filter, and being operative to adaptively update weighting coefficients of said adaptive filter.

Regarding claim 24, Choa discloses:

The receiver apparatus according to claim 23, wherein said filter update mechanism is operative to update weighting coefficients of said adaptive filter in accordance with at least one of:

- the output of a decision operator (decision element 140 in Fig. 4) to which said channel distortion-compensated output signal is coupled, said decision operator being operative to

produce an output data stream in accordance with prescribed decision criteria applied to said channel distortion-compensated output signal,

- an undistorted version (data d(k) in Fig. 4) of a known signal pattern contained in said optical communication signal and exclusive of a training signal, and

- prescribed statistics or other quantities one more system signals.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Bhatt et al. as primary reference

6. **Claims 9 and 25** are rejected under 35 U.S.C. 103(a) as being unpatentable over Bhatt.

Regarding claim 9, Bhatt does not expressly disclose:

The method according to claim 2, wherein step (b) comprises subjecting said channel distortion-compensated output signal and said at least one of the output of said decision

operator and said undistorted version of a known signal pattern contained in said optical communication signal to a prescribed synthesis operator to produce synthesized versions thereof, and processing said synthesized versions to update weighting coefficients of said adaptive IIR filter.

However, such synthesizing is a common practice in the art. One such practice of this kind of synthesizing is called whitening. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to produce whitened signals for processing in order to update the weighting coefficients of said adaptive IIR filter. One of ordinary skill in the art would have been motivated to do this since whitening is commonly used to aid in stabilizing adaptive filters.

Regarding claim 25, Bhatt does not expressly disclose:

The receiver apparatus according to claim 24, wherein said filter coefficient update mechanism is operative to subject said channel distortion-compensated output signal and said at least one of the output of said decision operator and said undistorted version of a known signal pattern contained in said optical communication signal to a prescribed synthesis operator to produce synthesized versions thereof, and to process said synthesized versions to update weighting coefficients of said adaptive filter.

However, such synthesizing is a common practice in the art. One such practice of this kind of synthesizing is called whitening. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to produce whitened signals for processing in order to update the weighting coefficients of said adaptive IIR filter. One of ordinary skill in the art would have been motivated to do this since whitening is commonly used to aid in stabilizing adaptive filters.

Choa as primary reference

7. **Claims 1-3, 5-10, 13-15, and 17-20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Choa in view of Shynk ("Adaptive IIR Filtering").

Regarding claim 1, Choa discloses:

A method for processing an optical communication signal (signal in fiber 110 in Fig. 4) that has been transported over a dispersive optical communication channel (fiber 110 in Fig. 4), so as to recover an unknown information signal contained said optical communication signal, comprising the steps of:

(a) converting said optical communication signal into an electrical communication signal (detector 120 in Fig. 6); and

(b) filtering said electrical communication signal by means of an adaptive filter (adaptive equalizer 150 in Fig. 4) to produce a channel distortion-compensated output signal.

Choa does not expressly disclose:

said adaptive filter being an adaptive infinite impulse response (IIR) filter.

Rather, Choa generally notes that a typical adaptive filter can be a finite impulse response (FIR) filter (paragraph [0043]). However, Shynk teaches that adaptive IIR filters are also known to serve as adaptive filters (p. 4, col. 1, middle paragraph). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement the adaptive filter of Choa as an adaptive IIR filter. One of ordinary skill in the art would have been motivated to do this since an adaptive IIR filter "can provide significantly better performance than an adaptive FIR filter having the same number of coefficients...Alternatively, to achieve a specified level of performance, an IIR filter generally requires considerably fewer coefficients than the corresponding FIR filter. Because of the potential savings in computational

complexity, it is anticipated that the adaptive IIR filter will replace the widely-used adaptive FIR filter in many applications" (Shynk, p. 5, col. 1, last paragraph).

Regarding claim 2, Choa in view of Shynk discloses:

The method according to claim 1, wherein filtering said electrical communication signal includes updating weighting coefficients (weight updater 240 in Fig. 4) of said adaptive filter by processing said channel distortion-compensated output signal and at least one of:

- the output of a decision operator (decision element 140 in Fig. 4) to which said channel distortion-compensated output signal is coupled, said decision operator being operative to produce an output data stream in accordance with prescribed decision criteria applied to said channel distortion-compensated output signal,

- an undistorted version (data d(k) in Fig. 4) of a known signal pattern contained in said optical communication signal,

- prescribed statistics or other quantities of one or more system signals.

Regarding claim 3, Choa in view of Shynk discloses:

The method according to claim 2, wherein step (b) comprises updating weighting coefficients of said adaptive filter by processing said channel distortion-compensated output signal (processing in decision element 140 in Fig. 4) and the output of said decision operator (processing in adder 230).

Regarding claim 5, Choa in view of Shynk discloses:

The method according to claim 2 wherein step (b) comprises updating weighting coefficients of said adaptive IIR filter by processing said channel distortion-compensated output signal (signal from decision element 140 in Fig. 4) and an undistorted version of known signal pattern (data d(k) in Fig. 4, paragraph [0048]) contained in said optical communication signal.

Regarding claim 6, Choa in view of Shynk discloses:

The method according to claim 5, wherein step (b) comprises updating weighting coefficients of said adaptive IIR filter by differentially combining (adder 230 in Fig. 4) channel distortion-compensated output signal and an undistorted version of a known signal pattern contained in said optical communication signal to produce an error signal (error signal e(k) 250 in Fig. 4) and coupling said error signal to a coefficient generator for said adaptive filter.

Regarding claim 7, Choa in view of Shynk discloses:

The method according to claim 2, wherein said known signal pattern comprises a signal pattern exclusive (Choa, paragraph [0048], "representation of a known property of the input symbol") of a training signal pattern.

Regarding claim 8, Choa in view of Shynk does not expressly disclose:

The method according to claim 7, wherein said known signal pattern comprises a frame synchronization pattern.

However, frame synchronization patterns are well known in the art and commonly transmitted as part of optical communication transmissions to enable synchronized and intelligible reception of communication data. Frame synchronization patterns are often well-defined patterns. As such, they fit the description of the "determined symbol" employed by Choa in view of Shynk (Choa, paragraphs [0047-48]). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to employ a frame synchronization pattern as said known signal pattern. One of ordinary skill in the art would have been motivated to do this since doing so provides a suitable alternative to a training signal pattern, obviating the need for an explicit training signal pattern, thus simplifying the method of Choa in view of Shynk (note that Choa's preference for a "training data stream" leaves open the practice of employing suitable alternatives).

Regarding claim 9, Choa in view of Shynk does not expressly disclose:

The method according to claim 2, wherein step (b) comprises subjecting said channel distortion-compensated output signal and said at least one of the output of said decision operator and said undistorted version of a known signal pattern contained in said optical communication signal to a prescribed synthesis operator to produce synthesized versions thereof, and processing said synthesized versions to update weighting coefficients of said adaptive IIR filter.

However, such synthesizing is a common practice in the art. One such practice of this kind of synthesizing is called whitening. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to produce whitened signals for processing in order to update the weighting coefficients of said adaptive IIR filter. One of ordinary skill in the art would have been motivated to do this since whitening is commonly used to aid in stabilizing adaptive filters.

Regarding claim 10, Choa in view of Shynk discloses:

The method according to claim 1, wherein step (b) includes updating weighting coefficients of said adaptive IIR filter by processing said channel distortion-compensated output signal and multiple ones of

- the output of a decision operator (decision element 140 in Fig. 4) to which said channel distortion-compensated output signal is coupled, said decision operator being operative to produce an output data stream in accordance with prescribed decision criteria applied to said channel distortion-compensated output signal,

- an undistorted version (data d(k) in Fig. 4) of a known signal pattern contained in said optical communication signal, and

- prescribed statistics or other quantities of one or more system signals.

Regarding claim 13, Choa in view of Shynk discloses:

A receiver apparatus for processing an optical communication signal (signal in fiber 110 in Fig. 4) that has been transported over a dispersive optical communication channel (fiber 110 in Fig. 4), and recovering therefrom an unknown information signal contained in said optical communication signal, said receiver apparatus comprising:

an opto-electronic converter (detector 120 in Fig. 6) that is operative to convert said optical communication signal into an electrical communication signal;

an adaptive filter (adaptive equalizer 150 in Fig. 4) coupled to filter said electrical communication signal and producing a channel distortion-compensated output signal; and

a coefficient update mechanism (weight updater 240 in Fig. 4), which is operative to update weighting coefficients of said adaptive IIR filter.

Choa does not expressly disclose:

said adaptive filter being an adaptive infinite impulse response (IIR) filter.

Rather, Choa generally notes that a typical adaptive filter can be a finite impulse response (FIR) filter (paragraph [0043]). However, Shynk teaches that adaptive IIR filters are also known to serve as adaptive filters (p. 4, col. 1, middle paragraph). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement the adaptive filter of Choa as an adaptive IIR filter. One of ordinary skill in the art would have been motivated to do this since an adaptive IIR filter "can provide significantly better performance than an adaptive FIR filter having the same number of coefficients...Alternatively, to achieve a specified level of performance, an IIR filter generally requires considerably fewer coefficients than the corresponding FIR filter. Because of the potential savings in computational complexity, it is anticipated that the adaptive IIR filter will replace the widely-used adaptive FIR filter in many applications" (Shynk, p. 5, col. 1, last paragraph).

Regarding claim 14, Choa in view of Shynk discloses:

The receiver apparatus according to claim 13, wherein said coefficient update mechanism is operative to update weighting coefficients of said adaptive IIR filter in accordance with at least one of:

- the output of decision operator (decision element 140 in Fig. 4) to which said channel distortion-compensated output signal is coupled, said decision operator being operative to produce an output data stream in accordance with prescribed decision criteria applied to said channel distortion-compensated output signal,

- an undistorted version (data d(k) in Fig. 4) of a known signal pattern contained in said optical communication signal, and

- prescribed statistics other quantities of one or more system signals.

Regarding claim 15, Choa in view of Shynk discloses:

The receiver apparatus according to claim 14, wherein said coefficient update mechanism is operative to update weighting coefficients of said adaptive IIR filter by processing said channel distortion-compensated output signal (processing in decision element 140 in Fig. 4) and the output of said decision operator (processing in adder 230).

Regarding claim 17, Choa in view of Shynk discloses:

The receiver apparatus according to claim 14, wherein said coefficient update mechanism is operative to update weighting coefficients of said adaptive IIR filter by processing said channel distortion-compensated output signal (signal from decision element 140 in Fig. 4) and an undistorted version of a known signal pattern (data d(k) in Fig. 4, paragraph [0048]) contained in said optical communication signal.

Regarding claim 18, Choa in view of Shynk discloses:

The receiver apparatus according to claim 17, wherein said coefficient update mechanism is operative to update weighting coefficients of said adaptive IIR filter by differentially combining (adder 230 in Fig. 4) channel distortion-compensated output signal and an

undistorted version of a known signal pattern contained in said optical communication signal to produce an error signal (error signal e(k) 250 in Fig. 4) and coupling said error signal to a coefficient generator for said adaptive IIR filter.

Regarding claim 19, Choa in view of Shynk discloses:

The receiver apparatus according claim 14, wherein said known signal pattern comprises a signal pattern exclusive (Choa, paragraph [0048], "representation of a known property of the input symbol") of a training signal pattern.

Regarding claim 20, Choa in view of Shynk does not expressly disclose:

The receiver apparatus according to claim 19, wherein said known signal pattern comprises a frame synchronization pattern.

However, frame synchronization patterns are well known in the art and commonly transmitted as part of optical communication transmissions to enable synchronized and intelligible reception of communication data. Frame synchronization patterns are often well-defined patterns. As such, they fit the description of the "determined symbol" employed by Choa in view of Shynk (Choa, paragraphs [0047-48]). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to employ a frame synchronization pattern as said known signal pattern. One of ordinary skill in the art would have been motivated to do this since doing so provides a suitable alternative to a training signal pattern, obviating the need for an explicit training signal pattern, thus simplifying the method of Choa in view of Shynk (note that Choa's preference for a "training data stream" leaves open the practice of employing suitable alternatives).

8. **Claim 25** is rejected under 35 U.S.C. 103(a) as being unpatentable over Choa.

Regarding claim 25, Choa does not expressly disclose:

The receiver apparatus according to claim 24, wherein said filter coefficient update mechanism is operative to subject said channel distortion-compensated output signal and said

at least one of the output of said decision operator and said undistorted version of a known signal pattern contained in said optical communication signal to a prescribed synthesis operator to produce synthesized versions thereof, and to process said synthesized versions to update weighting coefficients of said adaptive filter.

However, such synthesizing is a common practice in the art. One such practice of this kind of synthesizing is called whitening. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to produce whitened signals for processing in order to update the weighting coefficients of said adaptive IIR filter. One of ordinary skill in the art would have been motivated to do this since whitening is commonly used to aid in stabilizing adaptive filters.

Double Patenting

9. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

10. **Claims 1-27** are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-15 and 17-18 of copending Application No. 10/653,316 in view of Winters et al. ("Electrical signal processing techniques in long-haul fiber-optic systems," hereinafter Winters) and Shynk. Although the conflicting claims are not identical, they are not patentably distinct from each other because the invention of the instant application is a variation of the invention of the copending application.

Claim in instant app.	Corresponding claim(s) in copending app.	Limitation(s) of claim of instant application NOT expressly disclosed in corresponding claim(s) of copending application
1	1	- converting said optical communication signal into an electrical communication signal - adaptive IIR filter obviousness argument: Winters teaches a related method to produce a channel-distortion compensated output signal that includes the step of converting an optical communication signal into an electrical communication signal. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to apply the signal processing techniques of the instant app. by employing such o/e converting. One of ordinary skill in the art would have been motivated to do this to reduce intersymbol interference in optical systems (Winters, p. 1439, section I. Introduction). Shynk teaches the use of adaptive IIR filters for channel equalization, synonymous to "inverse distortion" in instant app. (Shynk, p. 4, col. 1, middle paragraph). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement the adjustable inverse distortion operator as an adaptive IIR filter. One of ordinary skill in the art would have been motivated to do this since the "adjustable inverse distortion operator" is synonymous with "adaptive equalizer," which is one of the known applications of adaptive IIR filters. Also, in comparison with other implementations of adaptive equalizers, an adaptive IIR filter "can provide significantly better performance than an adaptive FIR filter having the same number of coefficients...Alternatively, to achieve a specified level of performance, an IIR filter generally requires considerably fewer coefficients than the corresponding FIR filter. Because of the potential savings in computational complexity, it is anticipated that the adaptive IIR filter will replace the widely-used adaptive FIR filter in many applications" (Shynk, p. 5, col. 1, last paragraph).
2	1	"weighting coefficients" of instant app. corresponds to "parameter estimates" of copending app.
3	2	
4	3	
5	4	
6	5	
7	6	
8	6	
9	7	
10	1	

11	8	
12	9	
13	10	See treatment of claim 1 above
14	10	
15	11	
16	12	
17	13	
18	14	
19	15	
20	15	
21	17	
22	18	
23	10	See treatment of claim 1 above
24	10	
25	10+7	
26	17	
27	18	

This is a provisional obviousness-type double patenting rejection.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Orlik et al. is cited to show a related apparatus for processing an optical communication signal that has been transported over a dispersive optical communication channel, and recovering therefrom an unknown information signal contained in said optical communication channel, said apparatus comprising an opto-electronic converter, an adaptive filter, and a filter coefficient update mechanism.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Kim whose telephone number is 571-272-3033. The examiner can normally be reached on Mon.-Fri. 9 AM to 5 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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